APPENDIX 5.6A

Alameda County Load and Resource Balance

Final Report

Electrical Load & Power Generation Evaluation - Alameda County

Mariposa Energy, LLC
Diamond Generating Corporation

June 3, 2009

June 2009

R·W·BECK

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Alameda County Load and Power Generation Evaluation

This report was prepared by R. W. Beck, Inc., at the request of Diamond Generating Corporation (Diamond) for the Mariposa Energy Project, pursuant to an agreement dated April 23, 2009. For this study, R. W. Beck performed a load and resource balance for Alameda County for the years 2009-2013 and summarized the results in the tables below. R. W. Beck concludes from the load resource balance that Eastern Alameda County has little local generation and would need substantial output from generation assets to produce enough power to meet the entire Eastern Alameda County load. The Mariposa Energy Project assists Eastern Alameda County's electrical energy needs by balancing and reinforcing the renewable generation that already exists in Eastern Alameda County, reducing the reliance on imports and by providing flexibility for local support at critical times, such as periods of decreasing renewable generation and peak load conditions. The purpose of the report is to establish the East County need for resources and capacity by analyzing the electrical loads in Alameda County and separating them into Western and Eastern Alameda County and then comparing them to the generation located in the Eastern and Western County.

For establishing the Alameda County energy needs, R. W. Beck utilized California Energy Commission (CEC) and Energy Information Administration (EIA) data to identify and characterize the generation in Alameda County. The CEC database contains information on power plants with a nameplate rating greater than 0.1MW.[1] The CEC also generates a report providing electricity consumption by county.[2] The CEC data for annual electricity consumption is available for 2006 and 2007.

Table 1
Annual Load of Alameda County

Year	2006	2007
Annual Load of Alameda County (GWh)	11097.58	11864.00

The forecast for load growth of Alameda County was developed for the years 2008-2013, the year after the Mariposa Energy Project is scheduled to come on-line. The load growth for Pacific Gas & Electric (PG&E) was established from the FERC 714 filing.[3] The percent load growth for PG&E and Alameda County is assumed to be the same.

[1] CEC list of all power plants greater than 0.1 MW – (http://energyalmanac.ca.gov/powerplants/index.html)
[2] CEC Electricity consumption by county – (http://www.ecdms.energy.ca.gov/elecbycounty.asp)
[3] FERC 714 filings – (http://www.ferc.gov/docs-filing/eforms/form-714/data.asp)

Table 2
Percent Load Growth for 2008-2013

Year	2008	2009	2010	2011	2012	2013
Load Growth %	1.10	1.10	1.16	1.21	1.05	0.85

Alameda County has been split into East and West County following the general division that is in the East County Area Plan ("ECAP"). East County consists of Dublin, Livermore, Pleasanton and all of the unincorporated areas. West County consists of Alameda, Albany, Berkeley, Emeryville, Fremont, Hayward, Newark, Oakland, Piedmont, San Leandro and Union City.

The total load of Alameda County was also divided into East and West County, by tabulating the population for the respective cities and unincorporated County areas. The population for East County was available through the ECAP[4]which lists the population growth of cities in Alameda County.[5] The historical load for Alameda County was divided into East and West by the corresponding population ratios. Load growth in Alameda County was assumed to occur 66.67% on the Eastern side of Alameda County and the remaining 33.3% on the Western side for years 2009-2013, since the West County area is fairly built out, while the East County area is expected to be the high growth area of the County.

Table 3 summarizes the load for Alameda County on an annual energy basis in GWh.

Table 3
Load of Alameda County (GWh)

Year	Load of Alameda County (GWh)	Load of East County (GWh)	Load of West County (GWh)	East County Percent of Total County Load
2009	12126.44	2780.13	9346.31	22.93
2010	12259.28	2868.74	9390.54	23.40
2011	12401.13	2963.35	9437.78	23.90
2012	12550.88	3063.23	9487.65	24.41
2013	12682.88	3151.28	9531.60	24.85

This table shows that the load in the eastern side of Alameda County is about 22-25% of the total Alameda County load, while the western side is approximately 75-78% of the total load of Alameda County.

Using the CEC database and EIA-860 data, R. W. Beck prepared a list of generators that are currently on-line and are proposed to be on-line from 2009-2013. Table 4

[4] East County Area Plan – (http://www.co.alameda.ca.us/cda/planning/plans/EastCountyAreaPlancombined.pdf)
[5] Alameda Cities Population – (http://www.co.alameda.ca.us/pdf/demographics.pdf)

presents this information. The Mariposa Energy Project has an on-line date of July 1, 2012, and is proposed to be located in the eastern part of the County.

Table 4
Alameda County Generators[6]

Plant Name	Unit	Commercial Online Date	Alameda County	Nameplate Capacity MW
Alameda	1	5/1/1986	West	27.4
Alameda	2	5/1/1986	West	27.4
Altamont Gas Recovery	GEN1	3/1/1969	East	3
Altamont Gas Recovery	GEN2	3/1/1989	East	3
Altamont Gas Recovery	GEN3	10/1/2002	East	1.3
Altamont Gas Recovery	GEN4	10/1/2002	East	1.3
Altamont Pass Windplant	ALL	1/1/1983	East	332.5
Diablo Wind	WT1 31	12/5/2004	East	18
Difwind Farms Ltd VII	GEN1	1/1/1987	East	24
Mariposa Energy	GT1	7/1/2012	East	46
Mariposa Energy	GT2	7/1/2012	East	46
Mariposa Energy	GT3	7/1/2012	East	46
Mariposa Energy	GT4	7/1/2012	East	46
Mulqueeney Ranch PS	PS 1	12/31/2012	East	140
Mulqueeney Ranch PS	PS 2	12/31/2012	East	140
Oakland	GEN1	11/1/1978	West	74.5
Oakland	GEN2	12/1/1978	West	74.5
Oakland	GEN3	11/1/1978	West	74.5
Patterson Pass	WND1	4/1/1985	East	8.1
Patterson Pass	WND2	1/1/1987	East	13.8
Pe Berkeley Inc	CC	6/1/1987	West	28.5
Pleasanton Solar	PV	8/1/2003	East	1.6
Russell City Energy Center	CC	6/30/2012	West	620
Ridgewood/Byron Power Partners	GEN1	4/1/1990	East	1.3
Ridgewood/Byron Power Partners	GEN2	4/1/1990	East	1.3
Ridgewood/Byron Power Partners	GEN3	4/1/1990	East	1.3
Ridgewood/Byron Power Partners	GEN4	4/1/1990	East	1.3
Ridgewood/Byron Power Partners	GEN5	4/1/1990	East	1.3
Santa Clara Wind	WGNS	1/1/1986	East	18
Santa Rita Correctional Facility	FC	6/1/2006	East	1
Santa Rita Correctional Facility	PV1	7/1/2001	East	0.519
Santa Rita Correctional Facility	PV2	10/1/2001	East	0.131
Santa Rita Correctional Facility	PV3	4/1/2002	East	0.53
SunE KHL20 Fremont	PV	12/25/2008	West	0.124
SunE KHL47 Pleasanton	PV	3/10/2008	East	0.323
WWTP Power Generation Station	GEN1	8/1/1985	West	2.2
WWTP Power Generation Station	GEN2	8/1/1985	West	2.2
WWTP Power Generation Station	GEN3	8/1/1985	West	2.2

[6] EIA 860 data – (http://www.eia.doe.gov/cneaf/electricity/page/eia860.html)

The capacity factors for the generators were computed based on historical data and averaged on an annual basis based upon data from the EIA 906 and EIA 923 database.[7] The capacity factors for new generation were assumed to be similar to other units with similar fuels. For Mariposa Energy, a capacity factor of 45.66% was assumed based upon the facility being available for 4000 hours per year, even though expected operations could be less than that.[8] For PV plants, a 20% capacity factor was assumed.[9]

Table 5 summarizes the capacity factors for all the generators:

Table 5
Capacity Factors

Plant Name	Prime Mover Category	Capacity Factor %
Alameda	GT	2.48
Altamont Gas Recovery	GT	69.59
Altamont Gas Recovery	IC	35.90
Altamont Pass Windplant	WT	21.58
Diablo Wind	WT	39.30
Difwind Farms Ltd VII	WT	22.03
Mariposa Energy	GT	45.66
Mulqueeney Ranch PS[10]	PS	15.00
Oakland	GT	2.34
Patterson Pass	WT	33.06
Pe Berkeley Inc	CC	84.96
Pleasanton Solar	PV	20.00
Russell City Energy Center[11]	CC	85.00
Ridgewood/Byron Power Partners	IC	16.12
Santa Clara Wind	WT	10.08
Santa Rita Correctional Facility	PV	20.00
SunE KHL20 Fremont	PV	20.00
SunE KHL47 Pleasanton	PV	20.00
WWTP Power Generation Station	IC	72.96

[7] EIA-906 and EIA-923 data (http://www.eia.doe.gov/cneaf/electricity/page/eia906_920.html)
[8] PG&E Long term RFO (http://www.pge.com/b2b/energysupply/wholesaleelectricsuppliersolicitation/allsourcerfo/)
[9] PV plants – http://www.utilipoint.com/issuealert/print.asp?id=1728
[10] Annual Energy for Mulqueeney Ranch PS – 184GWh (http://edocket.access.gpo.gov/2007/E7-15798.htm)
[11] The Annual Energy for Russell City Energy Center is estimated to be between 4500 and 4850 GWh. (http://www.energy.ca.gov/sitingcases/russellcity/documents/applicant_files/afc/vol-1/10.0%20Engineering.pdf)

Using the data, assumptions and methodology described above, the load and resource balance of Alameda County, along with assessments for eastern and western portions of the County are summarized on an annual energy basis. Table 6 shows the net generation in Alameda County on a GWh basis and the corresponding load allocated to the appropriate part of the County, for the years 2009-2013.

Table 6
Net Generation from 2009-2013 (GWh)

Plant Name	Unit	On-Line Date	County	Net Generation GWh				
				2009	2010	2011	2012	2013
Alameda	1	5/1/1986	West	5.96	5.96	5.96	5.96	5.96
Alameda	2	5/1/1986	West	5.96	5.96	5.96	5.96	5.96
Altamont Gas Recovery	GEN1	3/1/1969	East	18.29	18.29	18.29	18.29	18.29
Altamont Gas Recovery	GEN2	3/1/1989	East	18.29	18.29	18.29	18.29	18.29
Altamont Gas Recovery	GEN3	10/1/2002	East	7.92	7.92	7.92	7.92	7.92
Altamont Gas Recovery	GEN4	10/1/2002	East	7.92	7.92	7.92	7.92	7.92
Altamont Pass Windplant	ALL	1/1/1983	East	628.51	628.51	628.51	628.51	628.51
Diablo Wind	WT1 31	12/5/2004	East	61.96	61.96	61.96	61.96	61.96
Difwind Farms Ltd VII	GEN1	1/1/1987	East	46.31	46.31	46.31	46.31	46.31
Mariposa Energy	GT1	7/1/2012	East	0.00	0.00	0.00	92.00	184.00
Mariposa Energy	GT2	7/1/2012	East	0.00	0.00	0.00	92.00	184.00
Mariposa Energy	GT3	7/1/2012	East	0.00	0.00	0.00	92.00	184.00
Mariposa Energy	GT4	7/1/2012	East	0.00	0.00	0.00	92.00	184.00
Mulqueeney Ranch PS[12]	PS 1	12/31/2012	East	0.00	0.00	0.00	0.00	-216.47
Mulqueeney Ranch PS	PS 2	12/31/2012	East	0.00	0.00	0.00	0.00	-216.47
Oakland	GEN1	11/1/1978	West	15.25	15.25	15.25	15.25	15.25
Oakland	GEN2	12/1/1978	West	15.25	15.25	15.25	15.25	15.25
Oakland	GEN3	11/1/1978	West	15.25	15.25	15.25	15.25	15.25
Patterson Pass	WND1	4/1/1985	East	23.46	23.46	23.46	23.46	23.46
Patterson Pass	WND2	1/1/1987	East	39.97	39.97	39.97	39.97	39.97
Pe Berkeley Inc	CC	6/1/1987	West	212.12	212.12	212.12	212.12	212.12
Pleasanton Solar	PV	8/1/2003	East	2.80	2.80	2.80	2.80	2.80
Russell City Energy Center[13]	CC	6/30/2012	West	0.00	0.00	0.00	2308.26	4616.52
Ridgewood/Byron Power Partners	GEN1	4/1/1990	East	1.84	1.84	1.84	1.84	1.84
Ridgewood/Byron Power Partners	GEN2	4/1/1990	East	1.84	1.84	1.84	1.84	1.84
Ridgewood/Byron Power Partners	GEN3	4/1/1990	East	1.84	1.84	1.84	1.84	1.84
Ridgewood/Byron Power Partners	GEN4	4/1/1990	East	1.84	1.84	1.84	1.84	1.84
Ridgewood/Byron Power Partners	GEN5	4/1/1990	East	1.84	1.84	1.84	1.84	1.84
Santa Clara Wind	WGNS	1/1/1986	East	15.89	15.89	15.89	15.89	15.89
Santa Rita Correctional Facility	FC	6/1/2006	East	1.75	1.75	1.75	1.75	1.75
Santa Rita Correctional Facility	PV1	7/1/2001	East	0.91	0.91	0.91	0.91	0.91
Santa Rita Correctional Facility	PV2	10/1/2001	East	0.23	0.23	0.23	0.23	0.23
Santa Rita Correctional Facility	PV3	4/1/2002	East	0.93	0.93	0.93	0.93	0.93
SunE KHL20 Fremont	PV	12/25/2008	West	0.22	0.22	0.22	0.22	0.22
SunE KHL47 Pleasanton	PV	3/10/2008	East	0.57	0.57	0.57	0.57	0.57

[12] Since this is a pumped storage (PS) facility, and is less than 100% efficient, it will consume electrical energy. An 85% cycle efficiency was assumed. Cycle efficiencies for PS plants range from 70-85%. The annual energy for Mulqueeney Ranch PS is 184 GWh (http://edocket.access.gpo.gov/2007/E7-15798.htm).

[13] The Annual Energy for Russell City Energy Center is estimated to be between 4500 and 4850 GWh. (http://www.energy.ca.gov/sitingcases/russellcity/documents/applicant_files/afc/vol-1/10.0%20Engineering.pdf)

Plant Name	Unit	On-Line Date	County	Net Generation GWh 2009	2010	2011	2012	2013
WWTP Power Generation Station	GEN1	8/1/1985	West	14.06	14.06	14.06	14.06	14.06
WWTP Power Generation Station	GEN2	8/1/1985	West	14.06	14.06	14.06	14.06	14.06
WWTP Power Generation Station	GEN3	8/1/1985	West	14.06	14.06	14.06	14.06	14.06
Total Generation Historical (GWh)				1197.07	1197.07	1197.07	3873.33	6116.65
Load of Alameda County (GWh)				12126.44	12259.28	12401.13	12550.88	12682.88
Percent of Local Generation (Historical)				9.87%	9.76%	9.65%	30.86%	48.23%
Total Generation 90% Fossil (GWh)				3413.59	3413.59	3413.59	6582.94	9319.38
Percent of Local Generation (90% Fossil)				28.15%	27.84%	27.52%	52.45%	73.48%

Table 6 shows the total generation and the load of Alameda County on an annual energy basis in GWh. It also shows that the local generation, based upon historical capacity factors, is merely 9% of the load from 2009 to 2011 for the County. In 2012, the local generation increases to 30%, as Mariposa Energy and Russell City come on-line in the middle of 2012. As a full year of Mariposa Energy and Russell City generation is added in the County, the local generation percentage increases to approximately 48%. Even if all fossil fueled generation in Alameda County is operated at a 90% capacity factor, this only provides from 27% to 74% over te period 2009 – 2013 of the Alameda County electrical load and there is some concern as to the ability of some of the older units to operate at a 90% capacity factor for any significant length of time.

Similarly, load and resource balances were performed on the eastern and the western portions of Alameda County. The results have been tabulated in Tables 7 and 8.

Table 7
Load and Resource Balance of Eastern Side of Alameda County (Net GWh)

Plant Name	Unit	Online Date	County	2009	2010	2011	2012	2013
Altamont Gas Recovery	GEN1	3/1/1969	East	18.29	18.29	18.29	18.29	18.29
Altamont Gas Recovery	GEN2	3/1/1989	East	18.29	18.29	18.29	18.29	18.29
Altamont Gas Recovery	GEN3	10/1/2002	East	7.92	7.92	7.92	7.92	7.92
Altamont Gas Recovery	GEN4	10/1/2002	East	7.92	7.92	7.92	7.92	7.92
Altamont Pass Windplant	ALL	1/1/1983	East	628.51	628.51	628.51	628.51	628.51
Diablo Wind	WT1 31	12/5/2004	East	61.96	61.96	61.96	61.96	61.96
Difwind Farms Ltd VII	GEN1	1/1/1987	East	46.31	46.31	46.31	46.31	46.31
Mariposa Energy	GT1	7/1/2012	East	0.00	0.00	0.00	92.00	184.00
Mariposa Energy	GT2	7/1/2012	East	0.00	0.00	0.00	92.00	184.00
Mariposa Energy	GT3	7/1/2012	East	0.00	0.00	0.00	92.00	184.00
Mariposa Energy	GT4	7/1/2012	East	0.00	0.00	0.00	92.00	184.00
Mulqueeney Ranch PS	PS 1	12/31/2012	East	0.00	0.00	0.00	0.00	-216.47
Mulqueeney Ranch PS	PS 2	12/31/2012	East	0.00	0.00	0.00	0.00	-216.47
Patterson Pass	WND1	4/1/1985	East	23.46	23.46	23.46	23.46	23.46
Patterson Pass	WND2	1/1/1987	East	39.97	39.97	39.97	39.97	39.97
Pleasanton Solar	PV	8/1/2003	East	2.80	2.80	2.80	2.80	2.80
Ridgewood/Byron Power Partners	GEN1	4/1/1990	East	1.84	1.84	1.84	1.84	1.84
Ridgewood/Byron Power Partners	GEN2	4/1/1990	East	1.84	1.84	1.84	1.84	1.84
Ridgewood/Byron Power Partners	GEN3	4/1/1990	East	1.84	1.84	1.84	1.84	1.84
Ridgewood/Byron Power Partners	GEN4	4/1/1990	East	1.84	1.84	1.84	1.84	1.84
Ridgewood/Byron Power Partners	GEN5	4/1/1990	East	1.84	1.84	1.84	1.84	1.84
Santa Clara Wind	WGNS	1/1/1986	East	15.89	15.89	15.89	15.89	15.89
Santa Rita Correctional Facility	FC	6/1/2006	East	1.75	1.75	1.75	1.75	1.75
Santa Rita Correctional Facility	PV1	7/1/2001	East	0.91	0.91	0.91	0.91	0.91
Santa Rita Correctional Facility	PV2	10/1/2001	East	0.23	0.23	0.23	0.23	0.23
Santa Rita Correctional Facility	PV3	4/1/2002	East	0.93	0.93	0.93	0.93	0.93
SunE KHL47 Pleasanton	PV	3/10/2008	East	0.57	0.57	0.57	0.57	0.57
Total Eastern Generation Historical (GWh)				884.89	884.89	884.89	1252.89	1187.95
Load of East side of Alameda County (GWh)				2780.13	2868.74	2963.35	3063.23	3151.28
Percent of Local Generation (Historical)				31.83%	30.85%	29.86%	40.90%	37.70%
Total Generation 90% Fossil (GWh)				942.46	942.46	942.46	1667.62	1960.10
Percent of Local Generation (90% Fossil)				33.90%	32.85%	31.80%	54.44%	62.20%

Table 7 shows that the local generation in the eastern side of Alameda County is only 32% of the total load in 2009, increasing in 2012, as new generation comes online. In 2012, the local generation for Eastern Alameda County is 41% of the total load, and hence Eastern Alameda County would have to import the remaining 59% of its energy needs. Even if all the fossil fueled generation in Eastern Alameda County is dispatched at 90% capacity, the percentage of East County generation to meet East County load only increases to 33% to 62% over the period from 2009 to 2013. Even with the Mariposa Energy Project fully operational in 2013, Eastern Alameda County still needs to import 38% of its energy requirements.

Table 8
Load and Resource Balance of Western Side of Alameda County (Net GWh)

Plant Name	Unit	Online Date	County	2009	2010	2011	2012	2013
Alameda	1	5/1/1986	West	5.96	5.96	5.96	5.96	5.96
Alameda	2	5/1/1986	West	5.96	5.96	5.96	5.96	5.96
Oakland	GEN1	11/1/1978	West	15.25	15.25	15.25	15.25	15.25
Oakland	GEN2	12/1/1978	West	15.25	15.25	15.25	15.25	15.25
Oakland	GEN3	11/1/1978	West	15.25	15.25	15.25	15.25	15.25
Pe Berkeley Inc	CC	6/1/1987	West	212.12	212.12	212.12	212.12	212.12
Russell City Energy Center	CC	6/30/2012	West	0.00	0.00	0.00	2308.26	4616.52
SunE KHL20 Fremont	PV	12/25/2008	West	0.22	0.22	0.22	0.22	0.22
WWTP Power Generation Station	GEN1	8/1/1985	West	14.06	14.06	14.06	14.06	14.06
WWTP Power Generation Station	GEN2	8/1/1985	West	14.06	14.06	14.06	14.06	14.06
WWTP Power Generation Station	GEN3	8/1/1985	West	14.06	14.06	14.06	14.06	14.06
Total Western Generation Historical (GWh)				312.18	312.18	312.18	2620.44	4928.70
Load of West Alameda County (GWh)				9346.31	9390.54	9437.78	9487.65	9531.60
Percent of Local Generation (Historical)				3.340%	3.324%	3.308%	27.620%	51.709%
Total Generation 90% Fossil (GWh)				2471.16	2471.16	2471.16	4915.55	7359.35
Percent of Local Generation (90% Fossil)				26.44%	26,31%	26.18%	51.81%	77.21%

Similarly, the western local generation of Alameda County is merely 3% of the total load in 2009 increasing to 52% after the Russell City Energy Center is in operation. Therefore, the Western County also has to import most of its energy. The local generation in the western side increases as new generation comes online and it reaches 52% in 2013. Even with all the West County fossil generation dispatched at a 90% capacity it only covers from 26% to 77% of the load in the West County over the period from 2009 to 2013.

R. W. Beck concludes that from the load resource balancing point of view, East Alameda County has little local generation, most of which is intermittent wind or solar/photovoltaic, which needs dispatchable generation support from facilities such as Mariposa Energy to generate power in order to balance the load needs of Alameda County. The Mariposa Energy Project helps meet Alameda County's electrical energy needs by providing additional local dispatchable generation, decreasing the amount of imported energy and providing system/grid support at critical times, such as periods of decreasing renewable generation and peak load conditions.